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DEVELOPMENT OF THE ENLISTMENT SCREENING TEST-EST FORMS 5 AND 6.(U)
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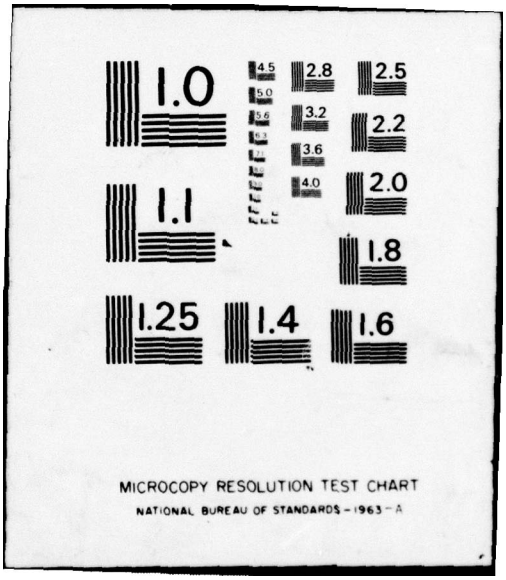
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DEVELOPMENT OF THE ENLISTMENT SCREENING TEST–EST FORMS 5 AND 6

By

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May 1976
Final Report for Period June 1975 – March 1976

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

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This final report was submitted by Personnel Research Division, Air Force Human Resources Laboratory, Lackland Air Force Base, Texas 78236, under project 7719, with HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235.

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This technical report has been reviewed and is approved.

LELAND D. BROKAW, Technical Director
Personnel Research Division

Approved for publication.

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This technical report deals with the development of an enlistment screening test which identifies those Air Force applicants most likely to meet ASVAB qualifying standards.

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PREFACE

This work was performed under Project 7719, Air Force Personnel Systems Development on Selection, Assignment, Evaluation, Quality Control, Retention, Promotion, and Utilization, Task 771912 Air Force Selection and Classification Programs.

The authors express their appreciation to Mr. Charles Greenway for his assistance with the computer programming and Mr. Malcolm James Ree for his contribution to the statistical analyses.

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DEVELOPMENT OF THE ENLISTMENT SCREENING TEST–EST FORMS 5 AND 6

I. INTRODUCTION

It has been estimated that the total cost to the Air Force for transportation, meals, and lodging for individuals taking the Armed Services Vocational Aptitude Battery (ASVAB) was $2.6 million in FY 74 and was estimated to be $2.9 million in FY 75. It was believed that a significant reduction in enlistment processing costs could be achieved through the use of an enlistment screening test that would identify those applicants highly likely to meet current ASVAB qualifying standards.

The *Enlistment Screening Test* (EST) was developed to serve such a purpose, with provisions for the test to be administered and scored at the local recruiting office. In this manner, the screening test would promptly eliminate from further consideration those enlistment applicants most likely not to achieve qualifying ASVAB scores at the centralized testing point.

II. DEVELOPMENT OF THE TEST

From the existing Air Force Human Resources Laboratory (AFHRL) test item pool, two forms of the experimental screening test were created. Each form contained 90 items; 30 in each of the content areas (Word Knowledge, Arithmetic Reasoning, and Space Perception). Items included in the experimental forms were selected on the basis of falling within a difficulty range of .45 to .90 with each item demonstrating high discriminating ability.

The experimental forms were sent to each of the five Recruiting Groups, who distributed them to a nationally representative sample of recruiting offices. In an effort to obtain an unrestricted range of abilities as measured by subsequent performance on ASVAB-3, pre-screening of prospective applicants was not conducted. From these experimental administrations, item analysis data was available for selecting the 45 items (15 from each content area) to be included in each final version of the EST.

Items to be included in the final version were selected to provide a test maximally discriminative around an AFQT of 31 and a 170 sum of the four Air Force aptitude indexes (Mechanical, Administrative, *General, and Electronics*). The approach used in the selection of items involved the "item characteristic curve" as introduced by Tucker (1946). The curve is essentially a fitted line through points obtained by plotting the proportion of correct respondees to a specific item against an external criterion score, which in this study was the ASVAB-3 AFQT score expressed in standardized "z" scores. With a normal ogive fitted through the points, the two parameters are X_{50} (the point at which 50% of the respondees passed the item) and β, which indicates the discrimination power of the item. With this information, selected items fell with an X_{50} range of approximately −1.00 and + .45 with the β value being as high as possible.

III. RESULTS AND DISCUSSION

Each final form of the EST contains 45 items (15 items in each of the three content areas) and requires up to 45 minutes for administration. This liberal time limit is designed to permit the slower applicant to finish. Testing is terminated when the applicant completes the 45 items. The test is scored by the recruiter, immediately providing information as to whether further processing is warranted.

Table 1 presents a summary of statistical information on EST-5 and EST-6. The data suggests the two forms are statistically parallel, with each demonstrating a high, positive correlation with Armed Forces Qualification Test (AFQT) and the Aptitude Index sum derived from ASVAB-3.

Tables A1 and A2 of the appendix present the cumulative percentages, within score percentages, and frequencies of qualification and disqualification based upon an AFQT of 31 and an Aptitude Index sum of

170. Using a cutting score of 15, the data reflects that, for Form 5, 31 percent of those who subsequently failed to qualify for enlistment on the basis of either criterion could have been identified, while rejecting only four percent of those who ultimately qualified. Using the same cutting score for Form 6, 34% of subsequent failures would have been detected while only six percent of those (who subsequently achieved qualifying ASVAB scores) would have been eliminated from further processing.

IV. CONCLUSIONS

While significant numbers of enlistment applicants would continue to be sent to a centralized testing point and fail to meet ASVAB qualifying standards, the use of the Enlistment Screening Test could be of benefit in increasing the proportion of successes. Cutting scores can be varied according to service needs but, even with the cutting score presented in this report, substantial savings in transportation, feeding, and lodging costs can be realized.

Table 1. **Summary Statistics (EST-5 and EST-6)**

Statistical Summaries	Form 5	Form 6
Sample Size (N)	535	499
Mean ($\bar{X}$)	27.94	28.55
Standard Deviation (SD)	10.16	10.43
EST vs MAGE (correlation)	.76	.74
EST vs AFQT (correlation)	.71	.72
Coefficient Alpha	.92	.93
Standard Error of Measurement (S.E.M.)	2.87	2.84
Mean (ASVAB-3 AFQT)	44.19	45.28
Standard Deviation (ASVAB-3 AFQT)	12.69	12.78
Mean Standardized Item Difficulty	.50	.51

REFERENCES

Tucker, L.R. Maximum validity of a test with equivalent items. *Psychometrika*, 1946, **21**, 1–13.

APPENDIX A. CUMULATIVE PERCENTAGES, WITHIN SCORE PERCENTAGES, AND FREQUENCIES OF QUALIFICATION AND DISQUALIFICATION

Table A1. Cumulative Percentages, Within Score Percentages, and Frequencies of Qualification and Disqualification Based Upon AFQT of 31 and MAGE of 170

	EST-5					
	Not Qualified			Qualified		
EST Score	Within Score Frequency	Within Score %	Cumulative %	Within Score Frequency	Within Score %	Cumulative %
45	0	0	100	6	100	100
44	0	0	100	16	100	98
43	2	15	100	13	85	94
42	0	0	99	17	100	91
41	0	0	99	16	100	87
40	0	0	99	12	100	83
39	0	0	99	15	100	80
38	1	5	99	19	95	76
37	1	6	98	16	94	71
	1	6	97	17	94	67
	0	0	96	24	100	63
34	2	11	96	16	89	56
33	0	0	95	13	100	52
32	0	0	95	20	100	49
31	0	0	95	11	100	44
30	0	0	95	15	100	41
29	0	0	95	14	100	37
28	3	18	95	14	82	34
27	1	6	93	16	94	30
26	1	11	92	8	89	26
25	7	41	92	10	59	24
24	6	43	87	8	57	22
23	4	33	82	8	67	20
22	11	61	80	7	39	18
21	5	50	72	5	50	16
20	8	57	68	6	43	14
19	9	56	63	7	44	13
18	5	45	56	6	55	11
17	10	59	53	7	41	10
16	13	68	46	6	32	08
15	8	30	37	8	50	06
14	12	67	31	6	33	04
13	10	63	23	6	37	03
12	3	60	15	2	40	01
11	3	75	13	1	25	01
10	4	66	11	2	34	01
9	6	100	08	0	0	
8	2	100	04	0	0	
7	0	100	03	0	0	
6	1	100	03	0	0	
5	2	100	02	0	0	
4	1	100	01	0	0	
3						
2						
1						
0						

Table A2. Cumulative Percentages, Within Score Percentages, and Frequencies of Qualification and Disqualification Based Upon AFQT of 31 and MAGE of 170

	EST-6					
	Not Qualified			Qualified		
EST Score	Within Score Frequency	Within Score %	Cumulative %	Within Score Frequency	Within Score %	Cumulative %
45	0	0	100	13	100	100
44	0	0	100	15	100	96
43	0	0	100	16	100	92
42	1	4	100	21	96	88
41	0	0	99	15	100	82
40	0	0	99	19	100	78
39	0	0	99	12	100	73
38	0	0	99	12	100	70
37	0	0	99	16	100	67
36	0	0	99	11	100	62
35	1	5	99	18	95	59
34	1	7	98	13	93	54
33	5	27	98	13	73	51
32	1	9	93	10	91	47
31	0	0	93	17	100	45
30	2	15	93	11	85	40
29	2	20	92	8	80	37
28	5	23	90	16	77	35
27	4	19	86	17	81	30
26	3	25	83	9	75	26
25	5	25	81	15	75	23
24	1	10	76	9	90	19
23	4	26	76	11	74	17
22	4	30	73	9	70	14
21	8	72	70	3	28	11
20	8	57	64	6	43	11
19	6	66	58	3	34	9
18	8	66	53	4	34	8
17	5	83	47	1	17	7
16	6	66	44	3	34	7
15	7	87	39	1	13	6
14	5	71	34	2	29	6
13	11	73	30	4	27	5
12	8	72	21	3	28	4
11	7	63	15	4	37	3
10	6	75	10	2	25	2
9	3	60	5	2	40	2
8	2	40	3	3	60	1
7	0	0	1	1	100	1
6	0	0	1	0	0	
5	1	100	1	0		
4	0	0	1	0		
3	1	100	1	0		
2	0			0		
1	0			0		
0	0			0		

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